FETC SUCCESS
U.S. Department of Energy
Federal Energy Technology Center

CLEAN AFFORDABLE FUELS

- [x] fossil energy
- [ ] environmental
- [ ] energy efficiency
- [ ] other

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CLEAN DIESEL FUEL FROM THE FISCHER-TROPSCH PROCESS

States Impacted:
Entire U.S.

Benefit Areas:
Energy Security, Environmental Quality Improved, New Jobs

Participants:
Federal Energy Technology Center, Center for Applied Energy Research (CAER), Southwest Research Institute (SwRI)

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Description

Fischer-Tropsch (F-T) chemistry commenced during World War II when the Germans found it necessary to develop alternative fuels to power their tanks during the war. The alternative fuel source was coal, indirectly converted to diesel fuel. Indirect conversion of any hydrocarbon fuel involves: (1) gasification of the hydrocarbon source to produce syngas (a mixture of carbon monoxide and hydrogen), and (2) conversion of the syngas utilizing Fischer-Tropsch (F-T) chemistry to produce a transportation-fuel product. The F-T process uses various catalysts to produce linear hydrocarbons and oxygenates, including unrefined gasoline, diesel, and wax ranges (which can be further refined to produce additional diesel fuel). Byproducts of the FT process are carbon dioxide and water.

Today, research at the Federal Energy Technology Center (FETC) is focused on improving the chemistry of the F-T process, primarily, FETC researchers and their partners, CAER and SwRI, are optimizing the catalyst and reaction conditions in order to maximum conversion of syngas, while producing a maximum diesel fuel-potential product mixture. SWRI is conducting diesel engine emission testing of the Fisher-Tropsch product wax which has been hyrdrocracked.

Goals

The F-T process is designed to produce a clean-burning diesel fuel capable of meeting projected clean air emission standards. Production of FT diesel from domestic hydrocarbon sources, such as coal, natural gas, and, biomass, will reduce the U.S. dependence on foreign oil imports.

Tangible Benefits

National: This project is helping the US to achieve energy security. Production of diesel fuels from domestic hydrocarbon sources will allow the use of the existing transportation fuel infrastructure, since it is compatible with conventional engines, as well as anticipated engine designs. The use of F-T diesel should also impact the economy positively; production of 2 million barrels of F-T diesel per day will result in a trade deficit reduction of $350 billion, and the creation of 660,000 new jobs. In addition, F-T diesel has a higher cetane number than its petroleum counterpart (>70 vs. 45), which means it can be blended with low-quality petroleum-derived diesel in order to increase the usable fraction of the heavier crude oil available. Finally, F-T is also environmentally beneficial. Compared to petroleum produced diesel, F-T diesel fuel has been shown to reduce emissions of: hydrocarbons (25-31%), carbon monoxide (34-38%), oxides of nitrogen (5%) and particulates (23-29%).

Regional: All areas of the nation will benefit from the use of F-T diesel, however, the first areas to derive benefits from the use of F-T diesel are California and Alaska. The State of California has already enacted legislation, scheduled to take effect in 2004, to reduce emissions from diesel engines. Incidentally, diesel produced by F-T process already exceeds the goals set forth in the California Air Resources Board (CARB) legislation. In Alaska, production of F-T diesel from North Slope natural gas wells will enable the Alaskan pipeline to operate at capacity flow long after the production of oil begins to decline.

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